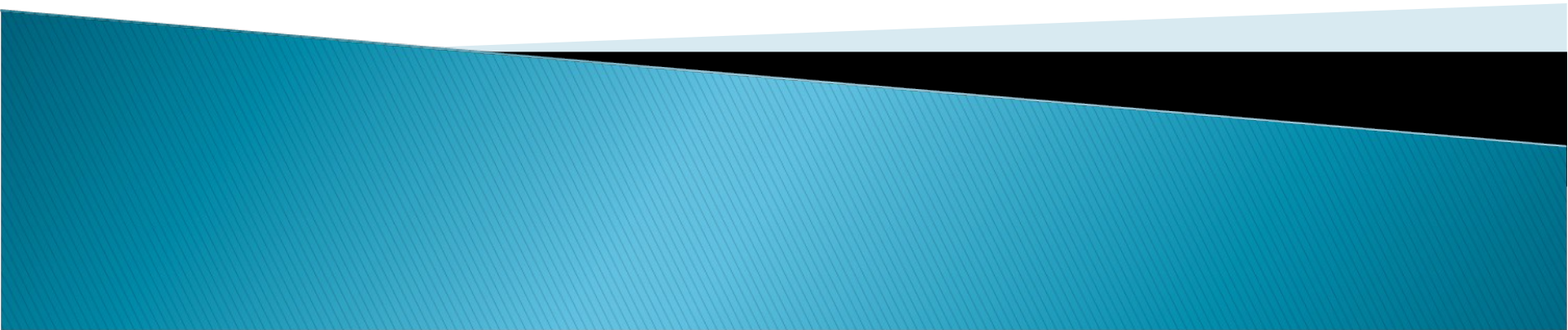
Why You Should Be An Amateur

Ben Jackson, N1WBV

QuahogCon, 4/25/2010



What Are We Going to Talk About?

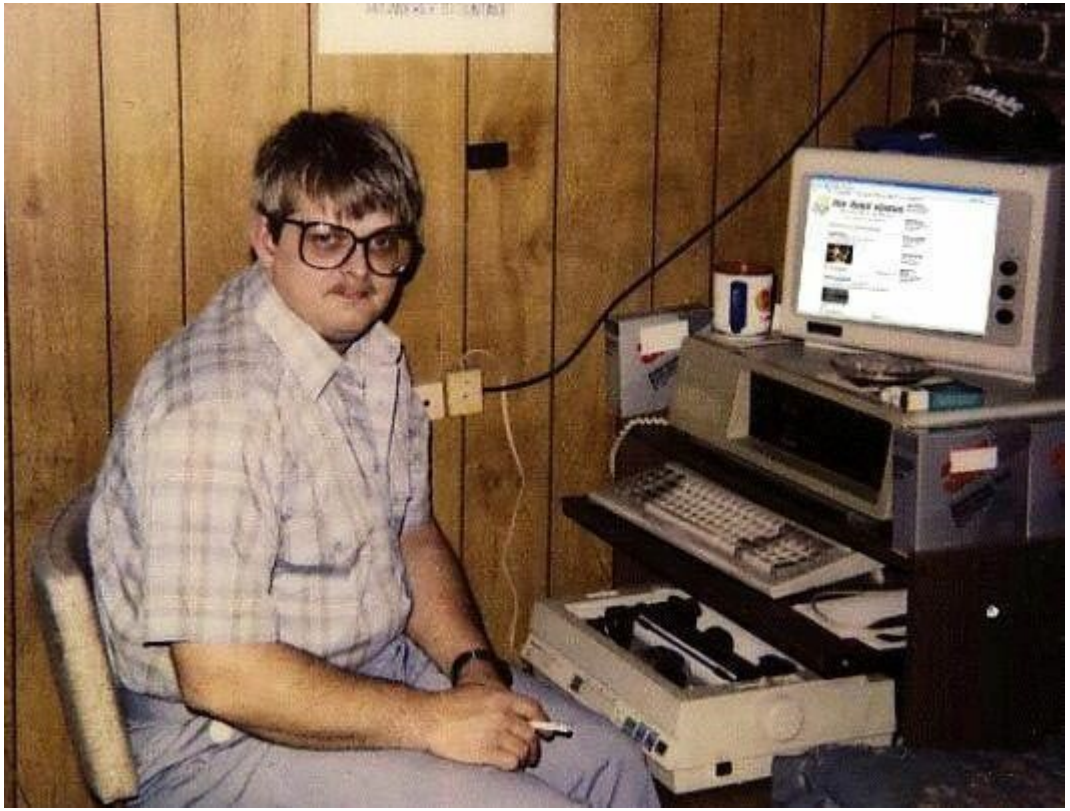
- What amateur radio is and isn’t
- What you can do with amateur radio
- How amateur radio can benefit you
- How you can benefit amateur radio
- How to become and amateur

Who am I?

- Amateur Radio Operator N1WBV
- “Into radios” since late 1980s
- Licensed since 1995
- Mild Manner Infosec practioner by day, wild and crazy geek by night

What Amateur Radio Isn't…

What hacking isn't…



What Amateur Radio Is…

Simply put, Amateur Radio Is…

Radio Hacking

A little bit of history…

- “Amateur Radio” first started with the first experimenters
  - Marconi, Tesla, Fessenden, Armstrong
- Officially established in USA in 1912 by “Radio Act”
  - Heavily influenced by industry
  - Private stations limited to 1500KHz and above
    - Considered Useless!

Talk to People (Around the World)

- “High Frequency” Bands
  - 0-30MHz
- Usually Big Radios
  - Big antennas too
- Lots of Money
  - $500 to $15000

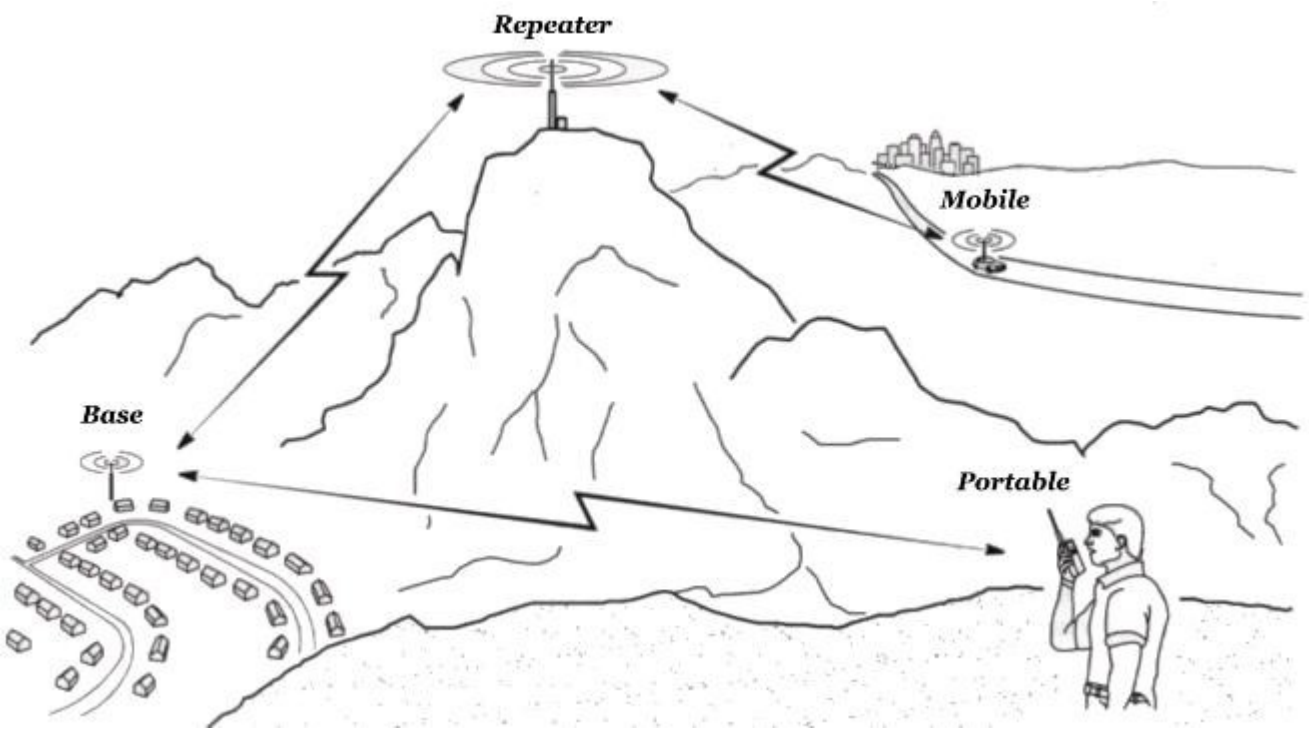
Talk to people (Around your area)

- VHF/UHF
  - 30MHz to 3GHz
    - Most Activity <1GHz
- Smaller Radios
- Cheaper too!
  - $100 to $600

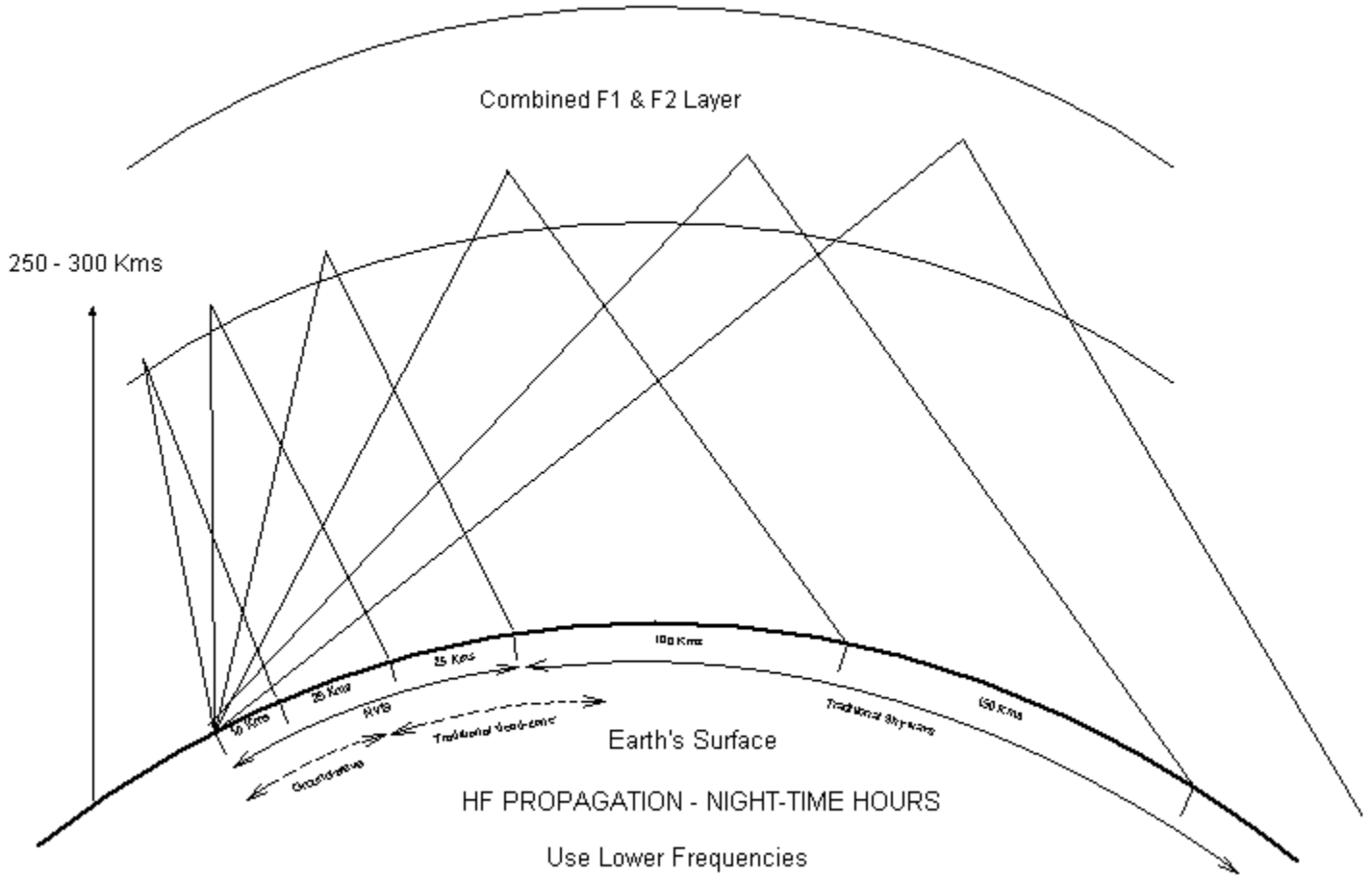
What's the difference?

- VHF/UHF primarily line of sight
  - 5 watts will give you a few miles in average terrain
  - Higher elevation will give you more range
    - By either you, or a "repeater"
- HF interacts with the ionosphere
  - Signals "skip" off ionosphere and are reflected back to the earth
  - Hundreds to thousands of miles
    - Sometimes more!

Line of Sight & Repeaters



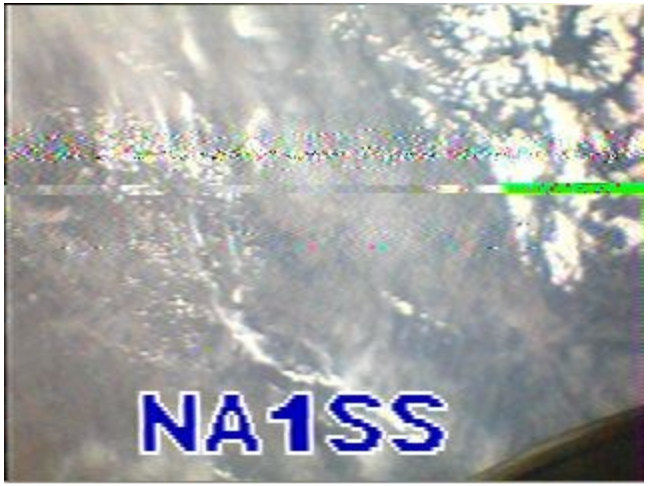
HF and the Ionosphere



Satellites!

- A lot of fun
  - A lot easier then most think
- Multiple HamSats in Orbit
  - Almost all “LEO” (Low Earth Orbit)
- Typical Range ~1500mi
  - Some longer, some shorter, depends on orbit

HAMS! IN! SPACE!!!!!!



2009-MAR-31 1907

2009-MAR-31 1730

Data connections

- Been around for longer then you think
  - Late 1940s Radio Teletype at 66 baud
- VHF/UHF fairly limited for speed
  - 1200/9600 baud respectively
  - Go ahead, try and download something
- However, there is an alternative…

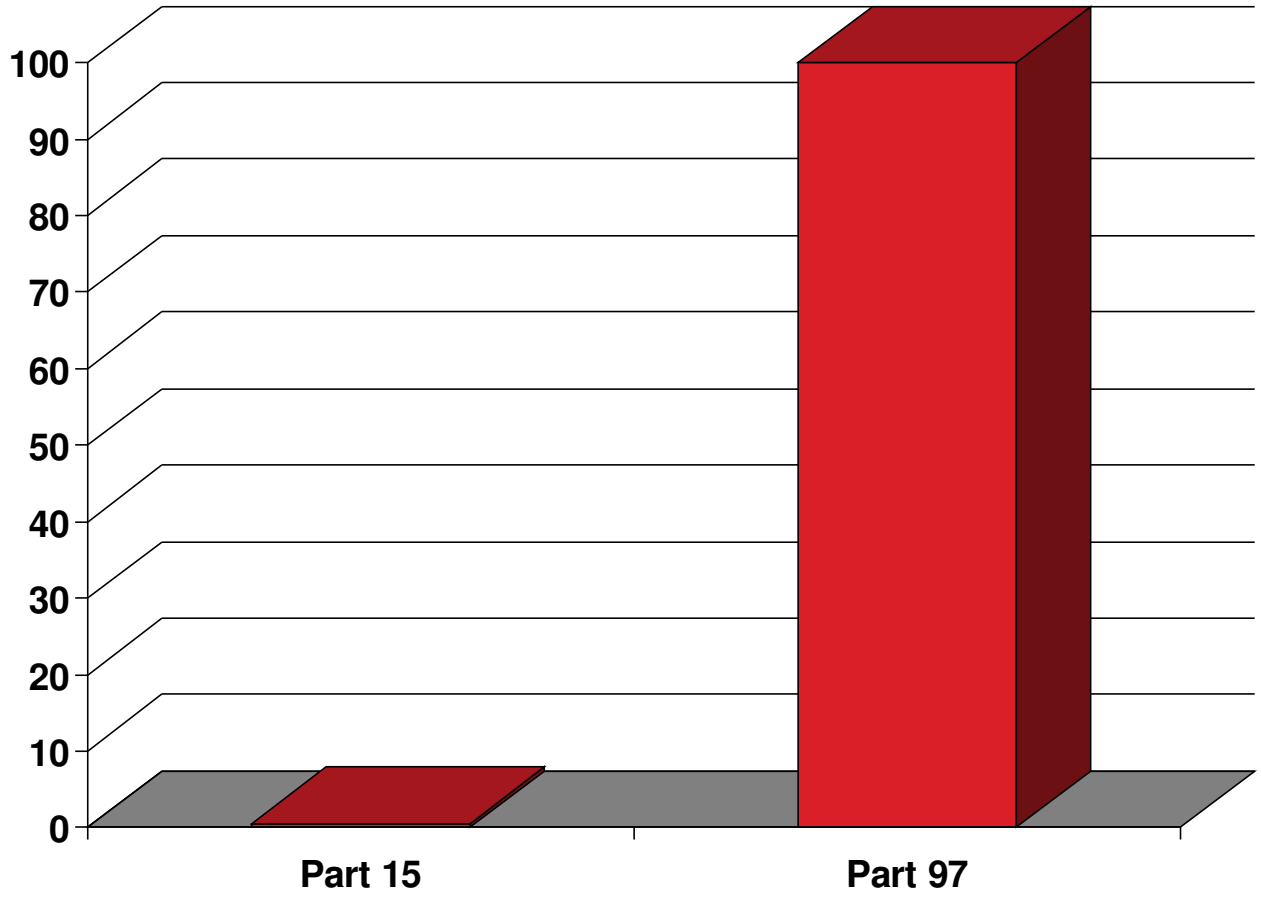
A little legal detour

- Part 97 and Part 15
  - Both Sections in the FCC rules
- Part 97 governs Amateur Radio
  - Experimental stuff
- Part 15 governs “consumer devices”
  - Have to be tested by FCC and cannot be modified
  - Check out your TV remote next time

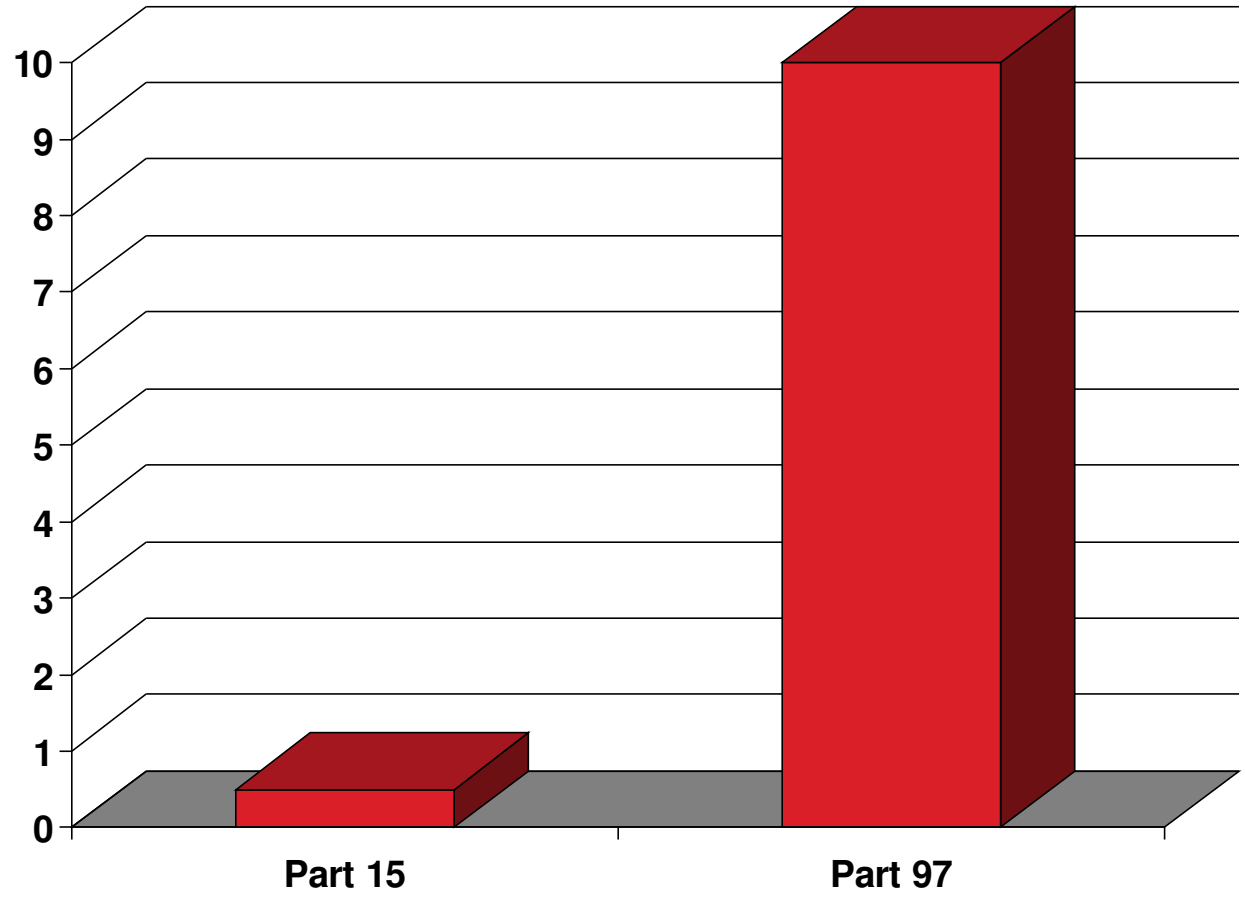
High Speed Multimedia

- Amateur radio bands overlap the 802.11b/g and 802.11a band segments
- Part 15 devices can be modified to fall under Part 97 ruleset
  - Antennas can be modified
  - Frequencies can be shifted
  - Wattage can be increased

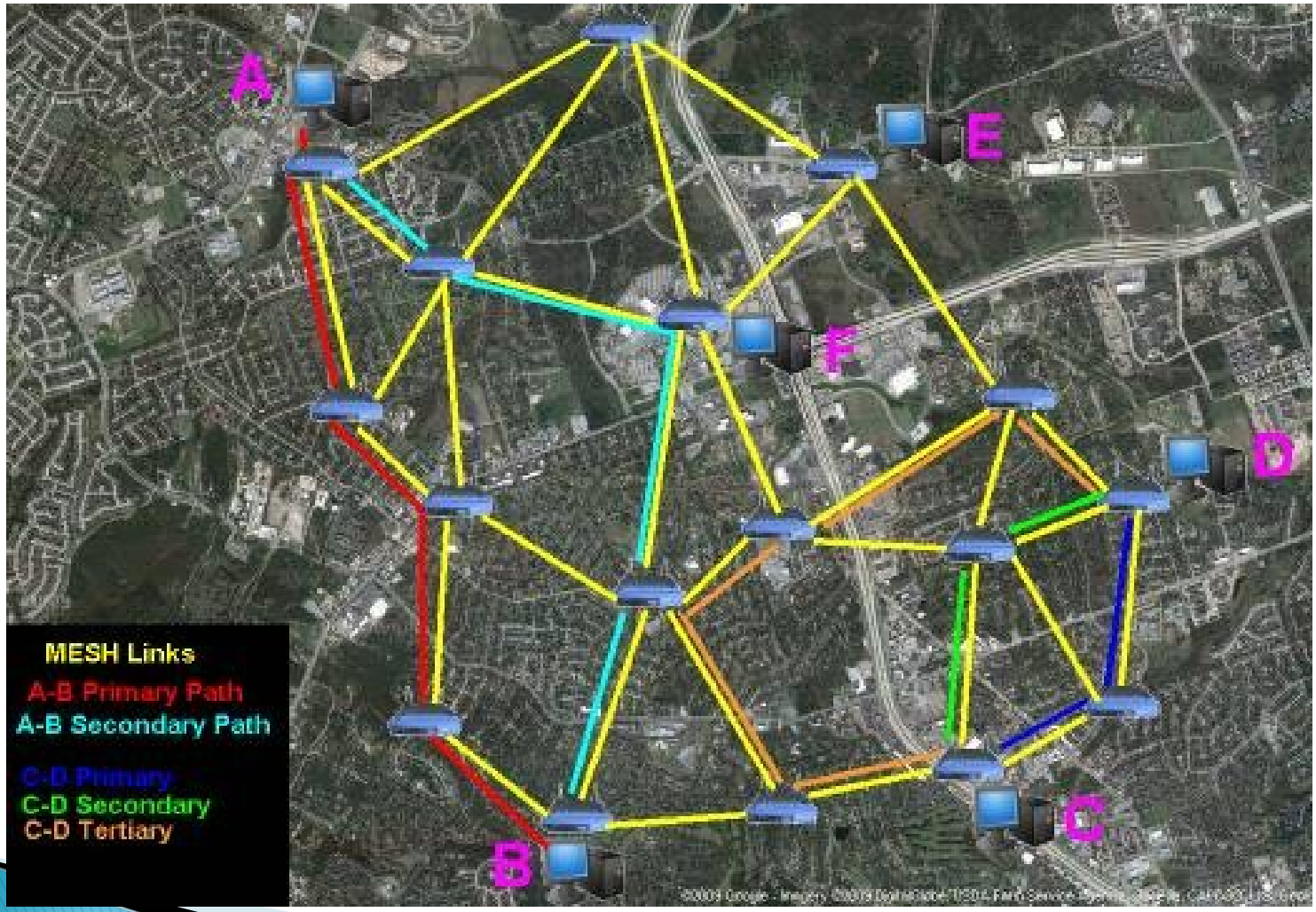
Part 15 vs Part 97 Power



Part 15 vs Part 97 Power (Future?)



OLSR


A
E
F
D
C
B
MESH Links
A-B Primary Path
A-B Secondary Path
C-D Primary
C-D Secondary
C-D Tertiary

Part 15 caveats

- “But I can already do this under Part 15!”
  - No, you can’t
- Technically illegal
  - Hefty fine and perhaps a FPMITA prison stay if you’re caught
    - SRSLY
- Thankfully, beyond this anything goes
  - Unlike… Say… Part 97…

Part 97 caveats

- Nothing with a pecuniary interest
  - You can't make money via Amateur Radio
- No music
  - MP3s? WAVs? MIDIs? Not ruling. Yet.
- Nothing "off color"
  - Very easily for traffic to violate rules
- Crazy "3rd party" restrictions
  - Interacting with a unlicensed station (Internet) via a licensed station has a lot of restrictions

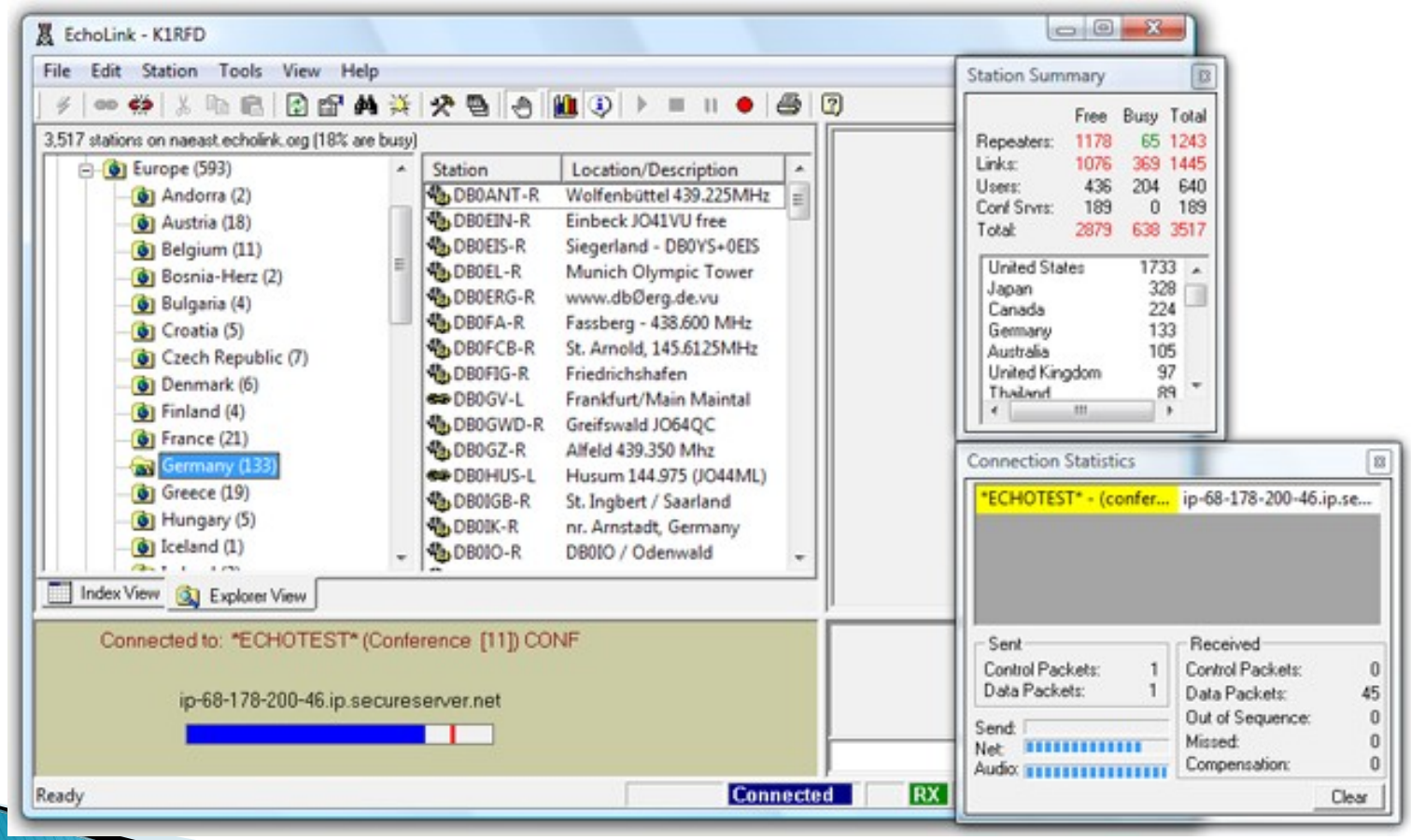
Stuff you can do with HSMM

- It’s your own private network!
  - ~10Mbps to your licensed friends
- Data connection across your town for telemetry
  - “UAV doing war flying” – Larry, KB1TNF, from PaulDotCom
- If you have a friendly ISP, you can have publically routable addresses.

Internet Radio Linking

- Two Big Players
  - Internet Radio Linking Project
    - Allows links between radios
  - EchoLink
    - Allows links between radios or a computer and a radio
- Both accomplish the same thing
  - Provide links between operators over IP based connections

EchoLink


EchoLink - K1RFD
File Edit Station Tools View Help
3,517 stations on naeast.echolink.org (18% are busy)
Europe (593)
Andorra (2)
Austria (18)
Belgium (11)
Bosnia-Herz (2)
Bulgaria (4)
Croatia (5)
Czech Republic (7)
Denmark (6)
Finland (4)
France (21)
Germany (133)
Greece (19)
Hungary (5)
Iceland (1)
Station
Location/Description
DB0ANT-R Wolfenbüttel 439.225MHz
DB0EIN-R Einbeck JO41VU free
DB0EIS-R Siegerland - DB0YS+0EIS
DB0EL-R Munich Olympic Tower
DB0ERG-R www.db0erg.de.vu
DB0FA-R Fassberg - 438.600 MHz
DB0FCB-R St. Arnold, 145.6125MHz
DB0FIG-R Friedrichshafen
DB0GV-L Frankfurt/Main Maintal
DB0GWD-R Greifswald JO64QC
DB0GZ-R Alfeld 439.350 Mhz
DB0HUS-L Husum 144.975 (JO44ML)
DB0IGB-R St. Ingbert / Saarland
DB0IK-R nr. Arnstadt, Germany
DB0IO-R DB0IO / Odenwald
Index View
Explorer View
Connected to: *ECHOTEST* (Conference [11]) CONF
ip-68-178-200-46.ip.secureserver.net
Ready
Connected
RX
Station Summary
Free Busy Total
Repeaters: 1178 65 1243
Links: 1076 369 1445
Users: 436 204 640
Conf Srvrs: 189 0 189
Total: 2879 638 3517
United States 1733
Japan 328
Canada 224
Germany 133
Australia 105
United Kingdom 97
Connection Statistics
ECHOTEST - (confer...
ip-68-178-200-46.ip.se...
Sent
Control Packets: 1
Data Packets: 1
Received
Control Packets: 0
Data Packets: 45
Out of Sequence: 0
Missed: 0
Compensation: 0
Send:
Net:
Audio:
Clear

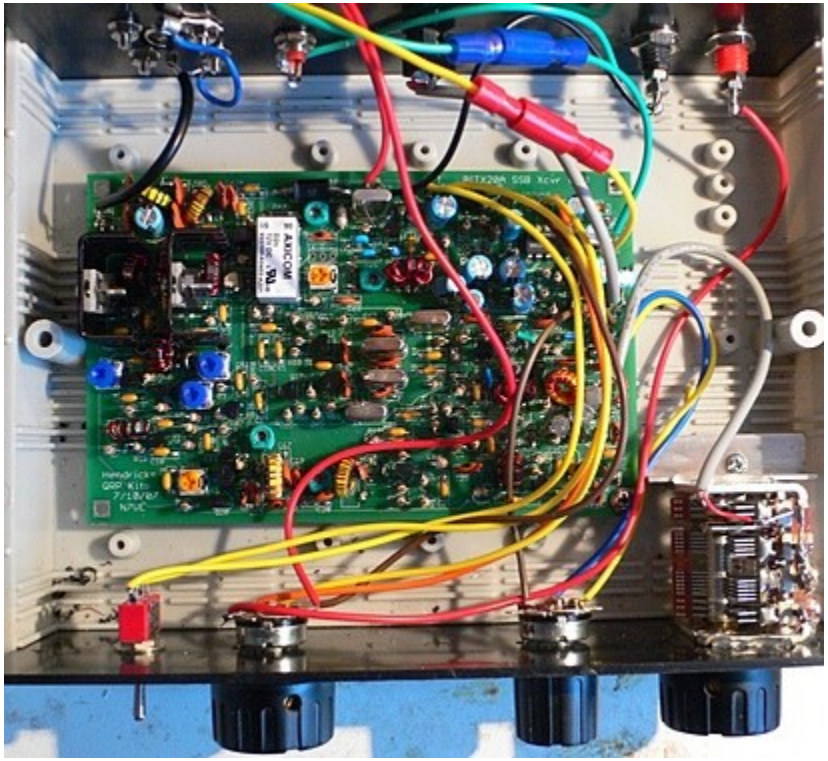
IRLP DEMO FAIL

- Whoops! Apparently the Hotel Providence is encased in lead. If you would like a demo, let’s talk after

Build and Modify Things

- Defining characteristic of amateur radio
- You name it, you can build it or hack it
  - Transmitters
  - Amplifiers
  - Transceivers
  - Antennas
- Other services need FCC approval

BITX-20



Software Defined Radio (SDR)

- Replacement of various radio components that have typically been implemented in hardware by software based components.
- The direct result is a radio that is a lot more flexible, more capable, and more hackable.
- Side benefit is that they are very easy to directly integrate into a computer.

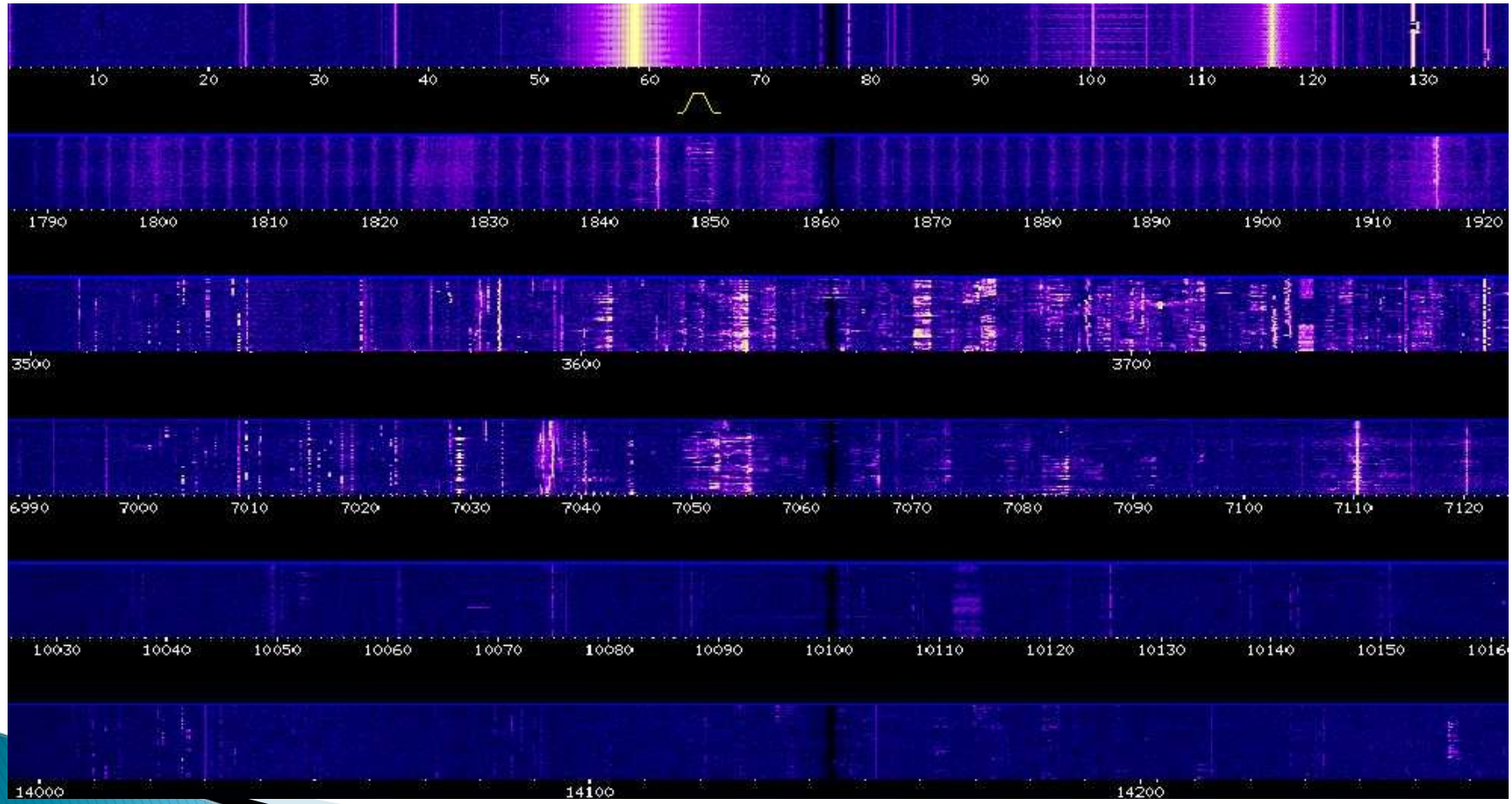
WebSDR

- A project to allow SDR receivers to be controlled over the web.
- Started by PT De Boer, PA3FWM
- Initially one station at the University of Twente, Netherlands
- Now almost 13 stations across the world

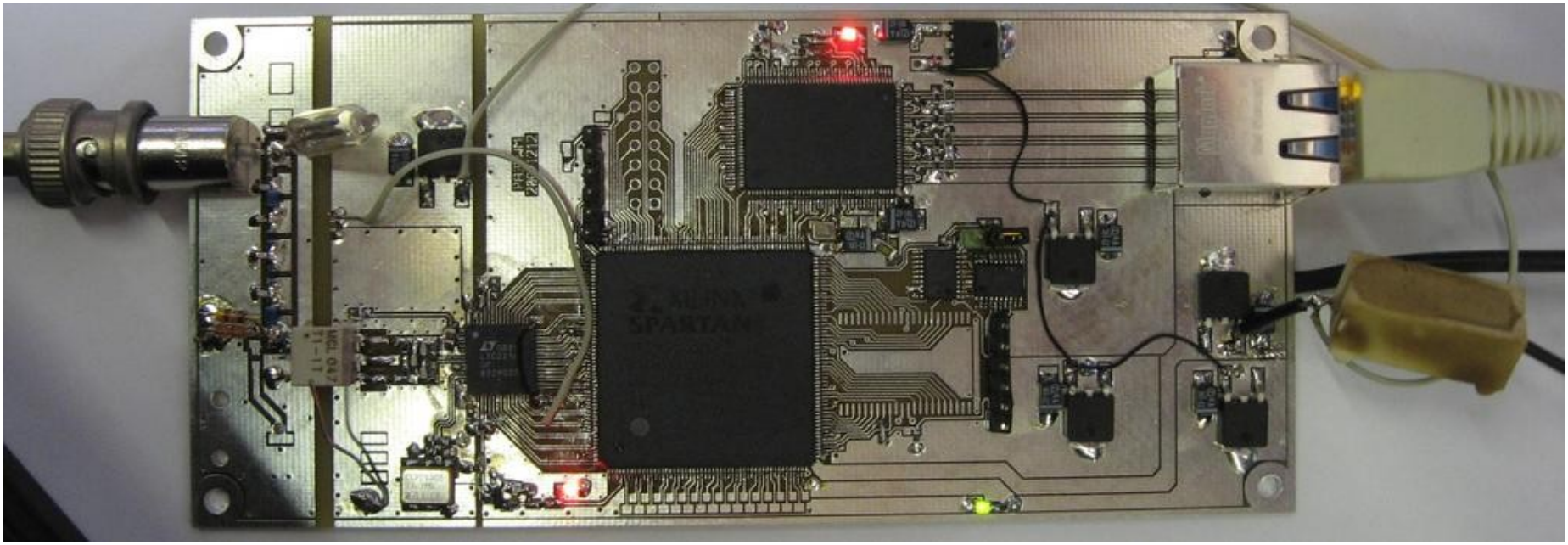
WebSDR

- Let’s try a demo….
- PT De Boer, PA3FWM original WebSDR station at University of Twente, Netherlands
- 7 Bands
  - No waiting!

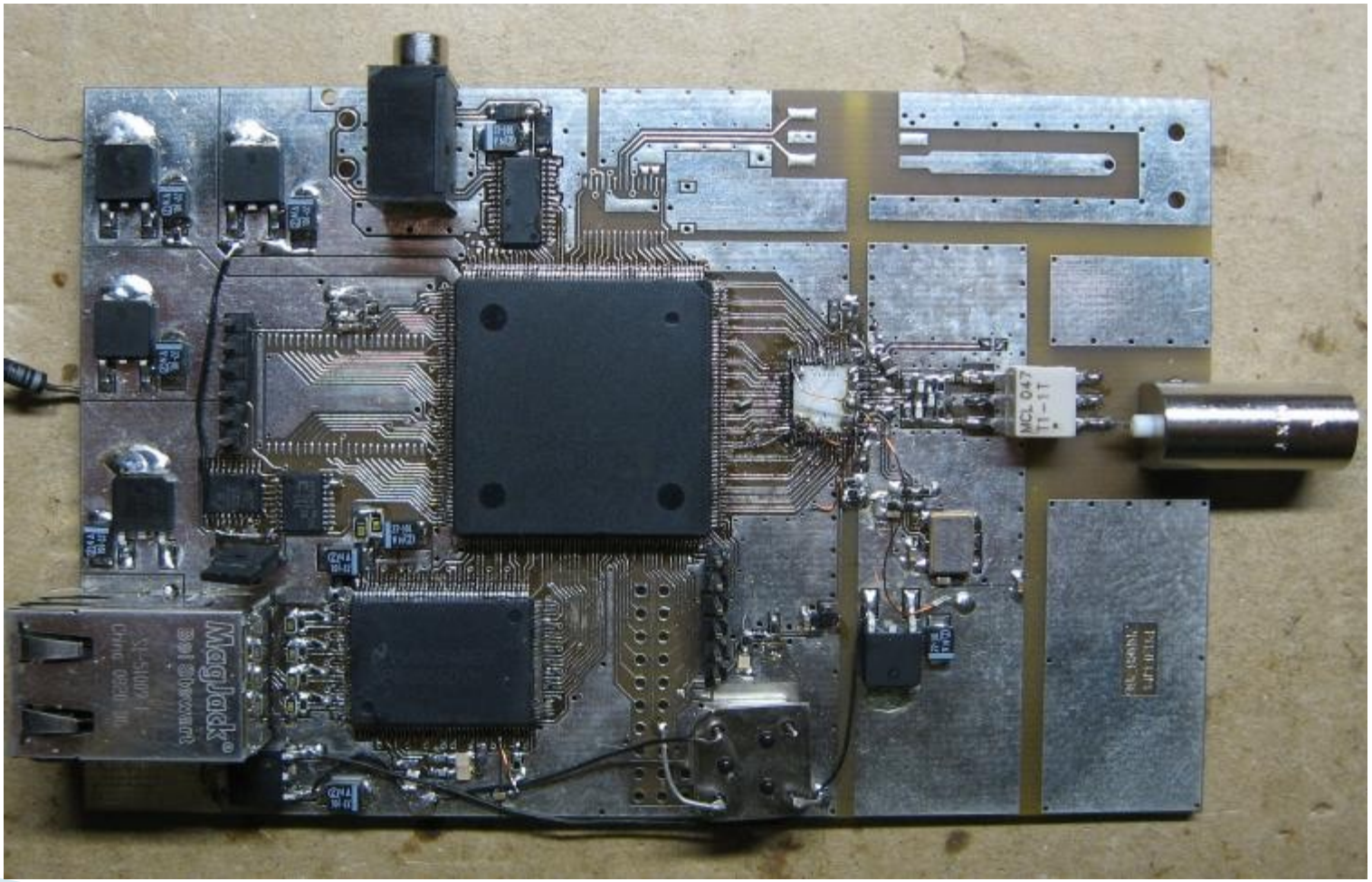
Had that worked…



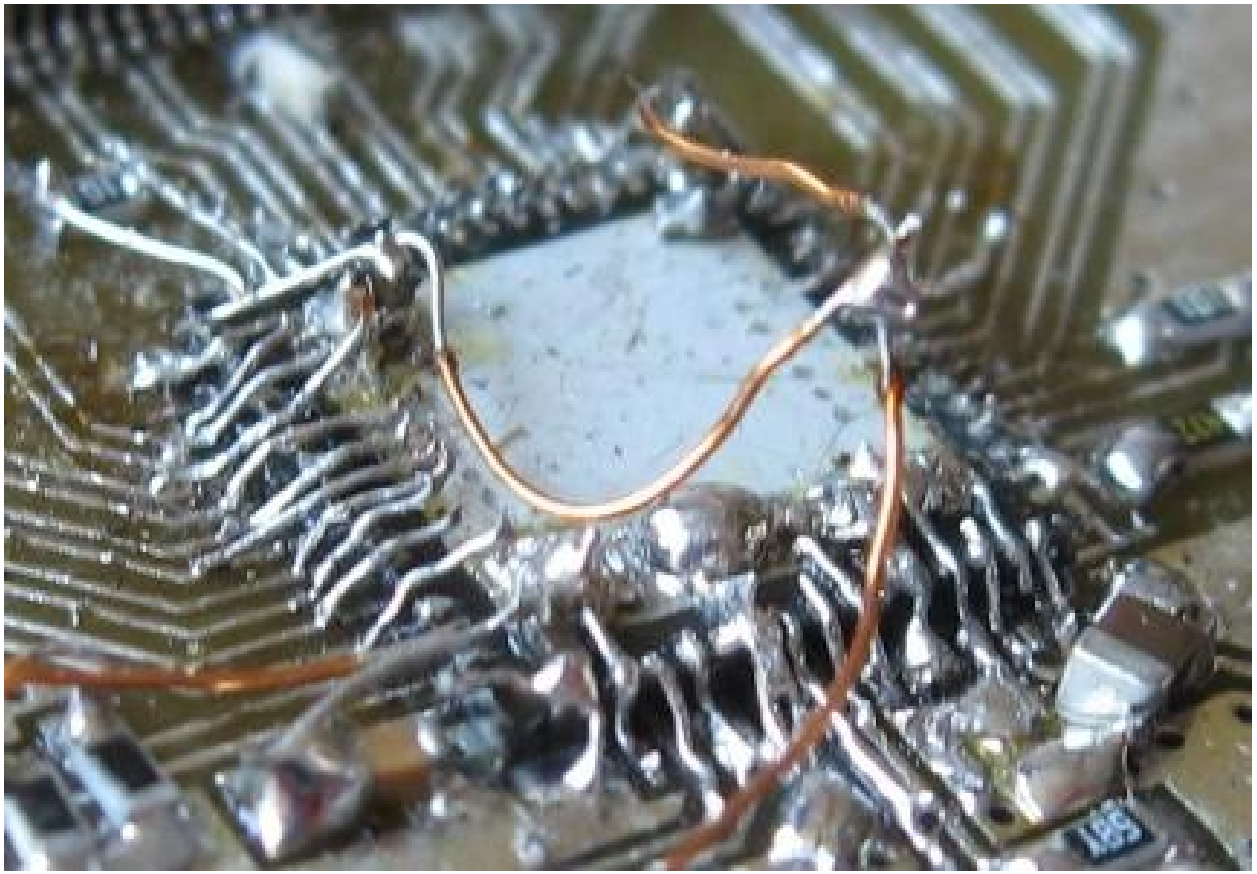
The WebSDR Reciever



The old WebSDR Reciever



“Soldering is easy!”

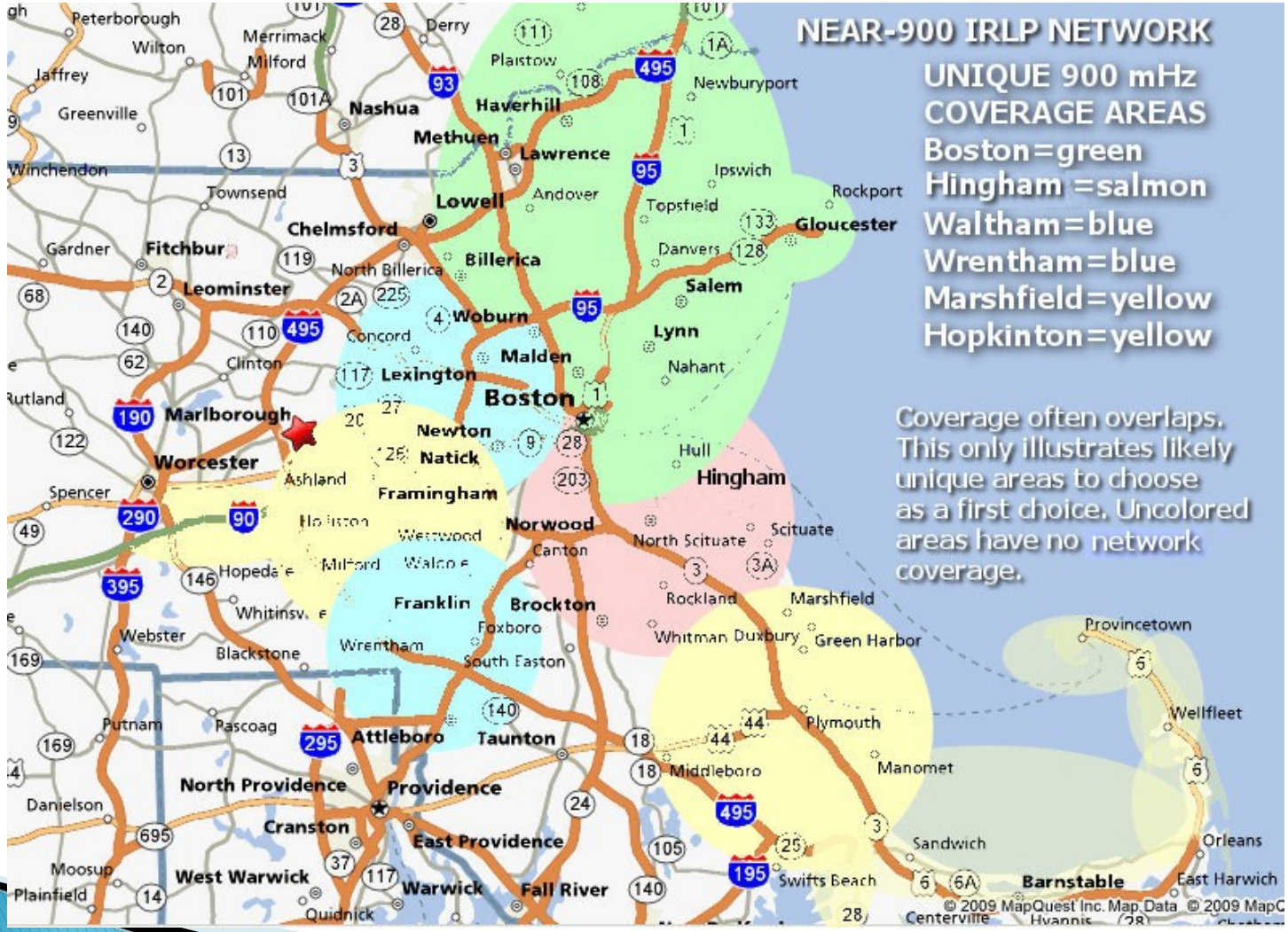


.2mm wires on a .5mm grid!

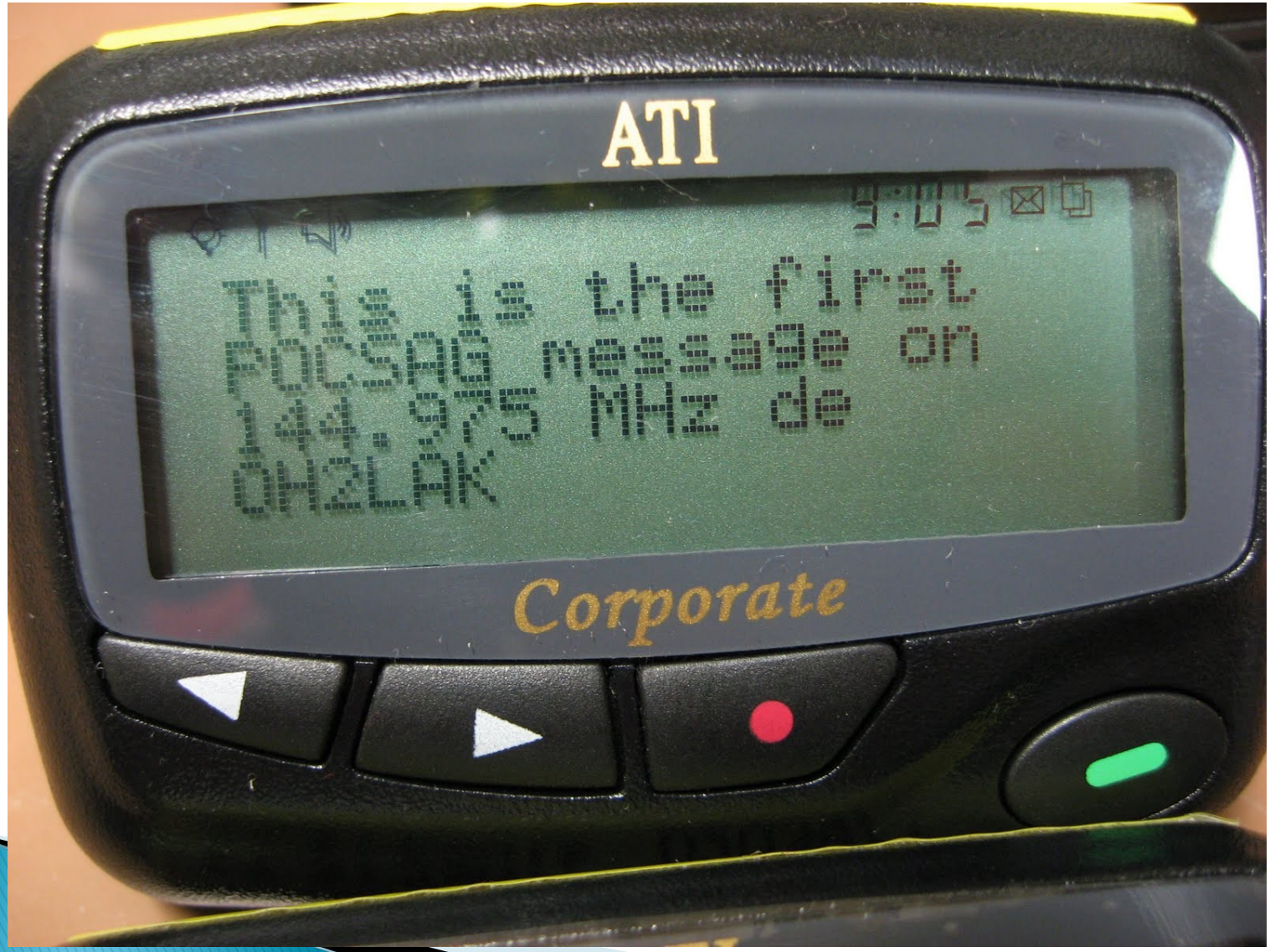
Repurpose, Reuse, & Recycle!

- Commercial bands often abuts amateur radio bands
  - Let’s be green and recycle!
- GE, Motorola, EF Johnson, and more!
  - Can often be reprogrammed through software
  - Or simple hardware modifications
- The Boston based “GEMOTO” Group has built an entire network out of surplus 900MHz (33cm) gear

NEAR-900 Network



Works for pagers too!



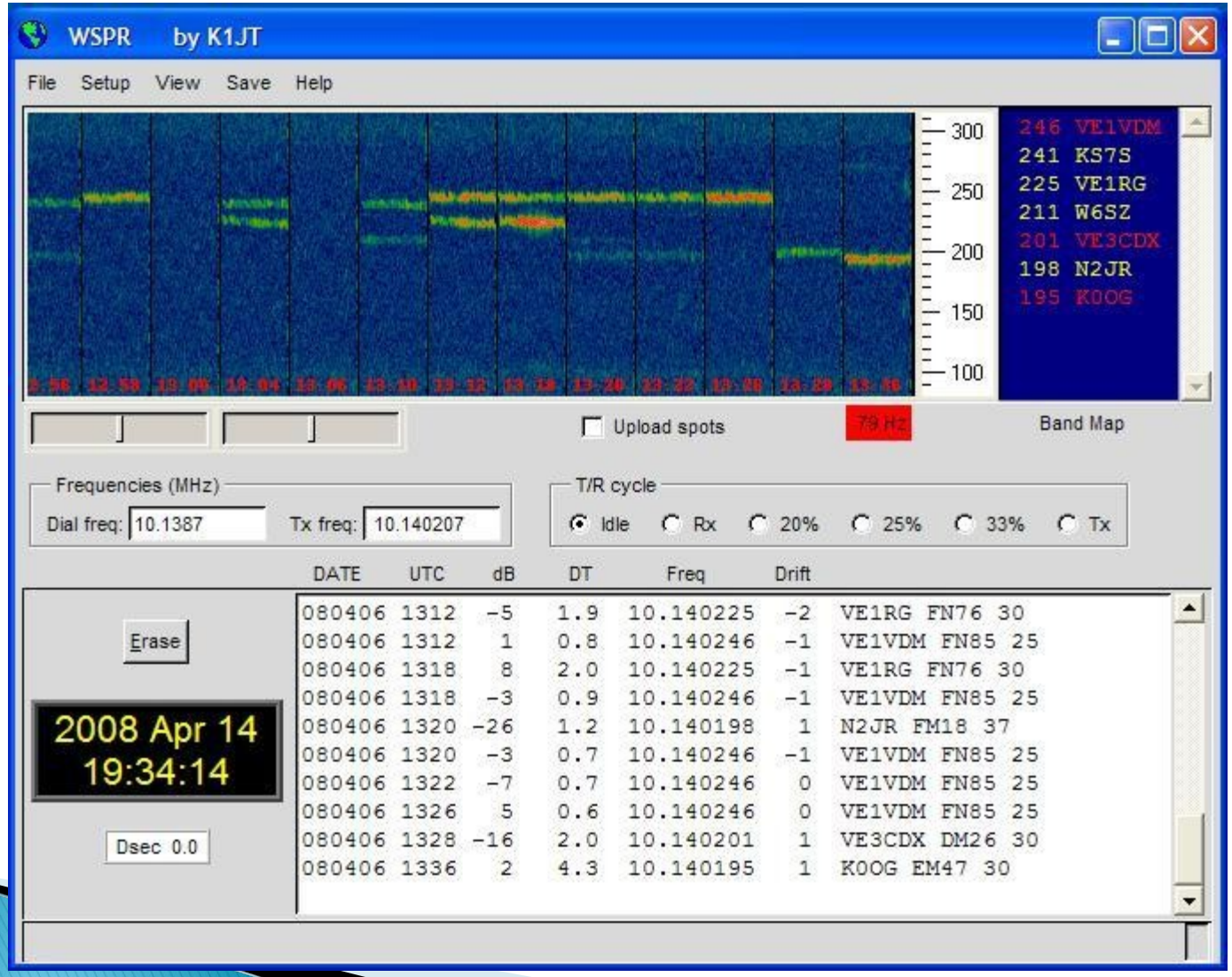
More recycling…

- Bad UPS at work or at home?
  - Likely only one cell is dead
  - Cells run at 12V
- Recycle the dead cells, keep the good cells, nice battery for operating your amateur radio equipment.

Weak Signal Propagation Reporter (WSPR)

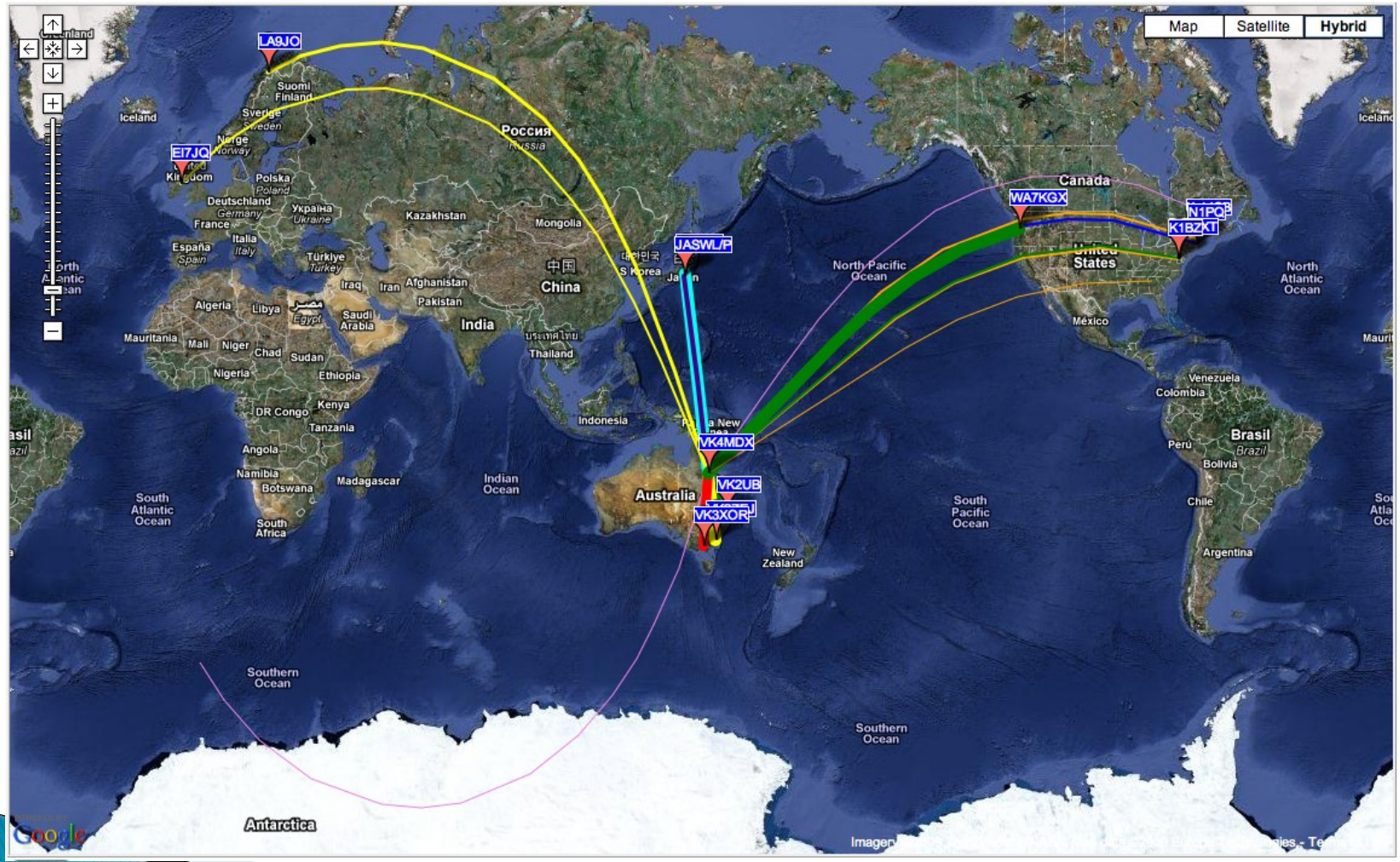
- Digital mode designed to be heard by computers “underneath” the noise.
- Only takes 6Hz of bandwidth
  - SSB: 2500Hz, FM: 10000Hz
  - Transmits data at a whopping 1.46 baud
- Primarily used to report band conditions on the HF bands
  - Can also be used for slooooooow conversations

WSPR Program



WSPR Output to Google Earth

Propagation Map



Emergency Communications

- Part of the original reason for Amateur Radio's creation
- Highly distributed "communications system"
- Not just in times of disaster either
  - Drills
  - Public Events

What you can do for Amateur Radio

Build More Things

- Homebrew is alive and well
  - 99.9% of all projects are for HF bands
- There is still innovation left in HF
  - Homebrew SDR projects
  - Minimalist Radio
- Still need to show VHF and UHF some home built lovin’

Push HSMM

- HSMM is woefully underutilized
  - Suffers from being classified as “not being Ham Radio” by the old timers
- A couple of high HSMM devices placed in high elevations could provide regional coverage for telemetry
- We have steadily lost the digital speed race to the commercial alternatives. Lets push back with innovation

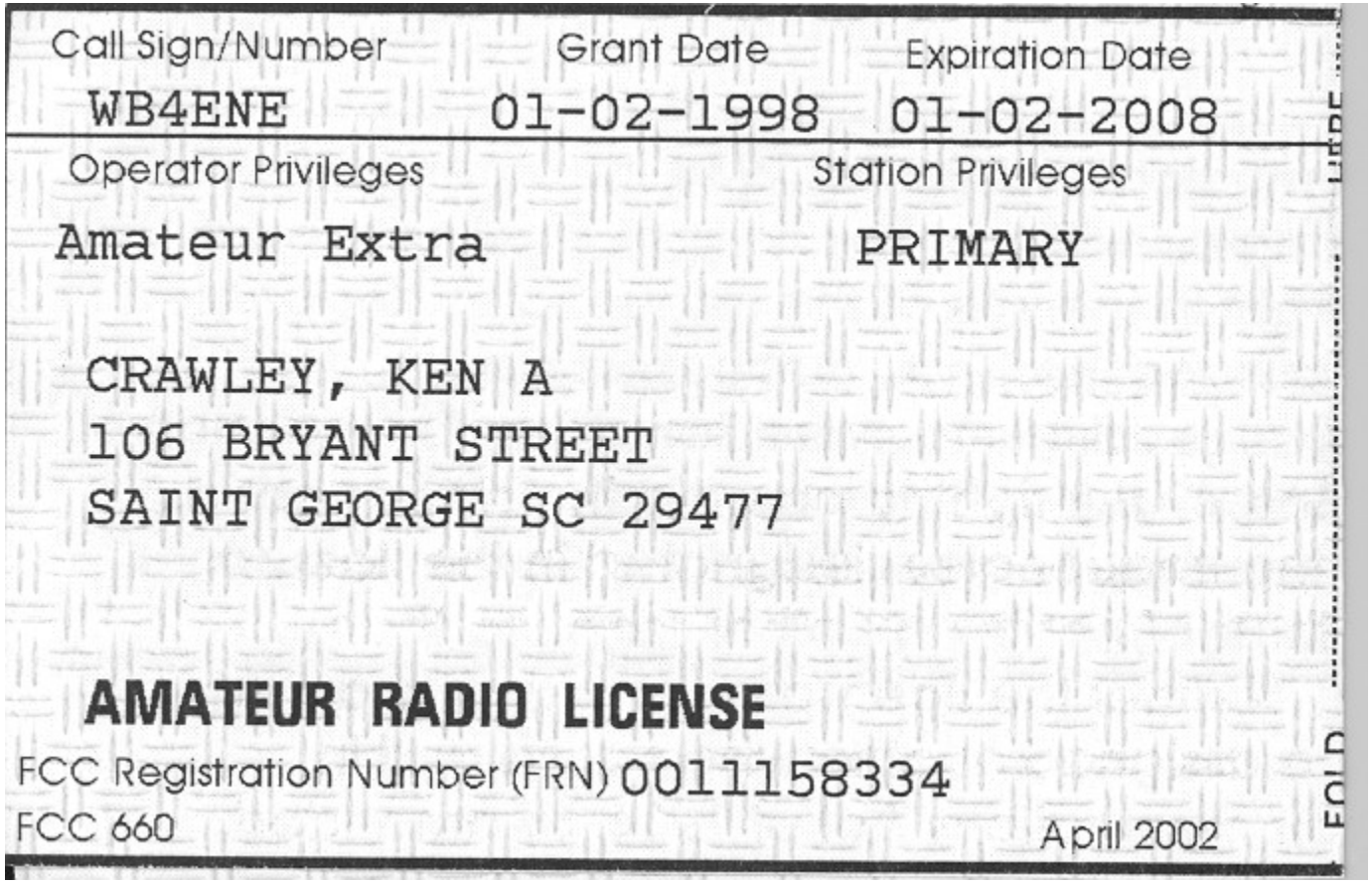
Push Open Source

- Some amateur radio software is open source
  - Large portion is not
- Closed systems are starting to encroach on our bands
  - ICOM's D-STAR
    - Open protocol with a closed codec
    - Some work on open implementations
- Some amateurs not seeing a problem

Simple stuff

- More Arduino Projects
- IP based projects
  - IPv6?
- Combat the “We’ve done that for years in Amateur Radio” syndrome.
  - That’s nice, but now we’re being surpassed by commercial services
- Fresh viewpoints on stuff “we’ve always done”

Getting your license



Call Sign/Number	Grant Date	Expiration Date
WB4ENE	01-02-1998	01-02-2008

Operator Privileges: Amateur Extra

Station Privileges: PRIMARY

CRAWLEY, KEN A
106 BRYANT STREET
SAINT GEORGE SC 29477

AMATEUR RADIO LICENSE

FCC Registration Number (FRN) 0011158334

FCC 660

April 2002

Getting Licensed

- Three Classes
  - Technician
    - 35 Question Exam
  - General
    - 35 Question Exam
  - Extra
    - 50 Question Exam
- No more Morse Code requirement!

Getting Licensed (cont.)

- Questions consist of basic electronics, operating procedures, rules, and regulations.
- Study guides available online and in DTF
  - Gordon West (WB6NOA)’s Guides
- Multiple online sites allow you take practice tests and track your progress
- A good month of studying should have you passing in the high 90s.

Getting Licensed (cont..)

- Each class of license has it’s own “question pool”
  - At least ten times the number of questions on the test
  - Rotated every four years
- Each test is multiple choice
- Tests are given at various locations by Volunteer examiners almost every weekend.

Some links

- American Radio Relay League
  - http://www.arrl.org
- QRZ
  - http://www.qrz.com
- HamTests
  - http://www.hamtests.co.uk/
    - UK and USA exams

Contact Me!

- e-Mail: bbj@innismir.net
- Website: http://www.innismir.net
- Twitter: http://www.twitter.com/innismir
- West Bridgewater, MA Repeater (146.775 DCS244) every morning

Questions?